

HFIP: Hurricane Forecast Improvement Project

NOAA's Project to Improve the Accuracy of Hurricane Guidance

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HFIP Goals

NOAA's hurricane program came together after Hurricane Katrina to identify the best ways to accelerate the improvement of hurricane forecasts and increase community resiliency.

HFIP set ambitious goals of reducing track and intensity forecast errors from 2009 to improve community response to warnings:

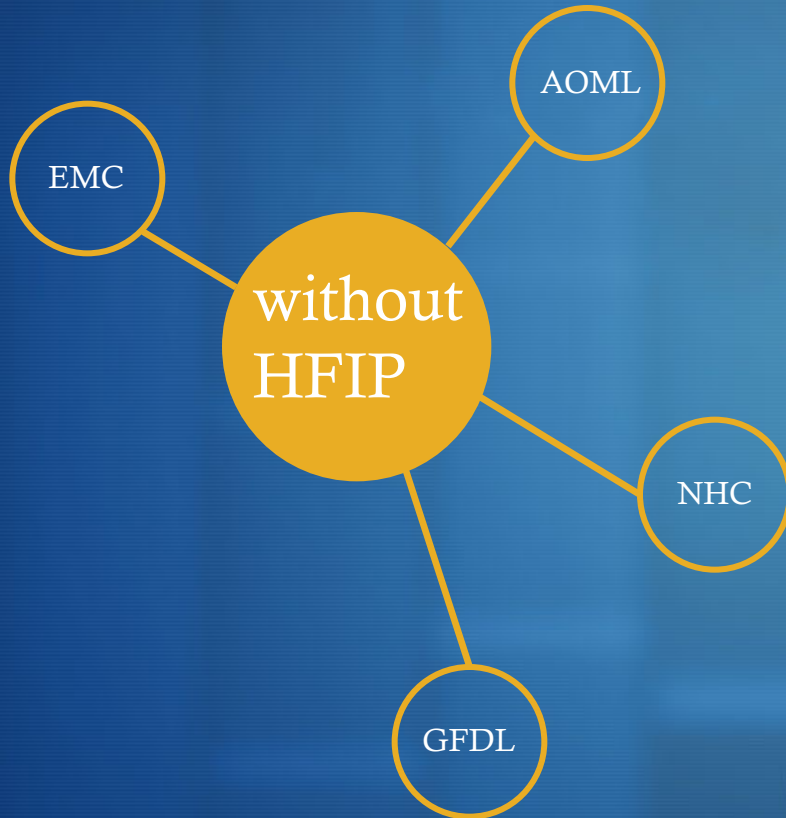
- ✓ Reduce forecast errors by 20% in five years
- Reduce forecast errors by 50% in ten years
- Increase forecast period out to 7 days

HFIP Keys to Success

Partnerships

- Federal Research Community
- Close Alignment of Research and Operations
- Federal and Academic Partnerships

These partnerships increased the number of people working together to address NOAA's priorities

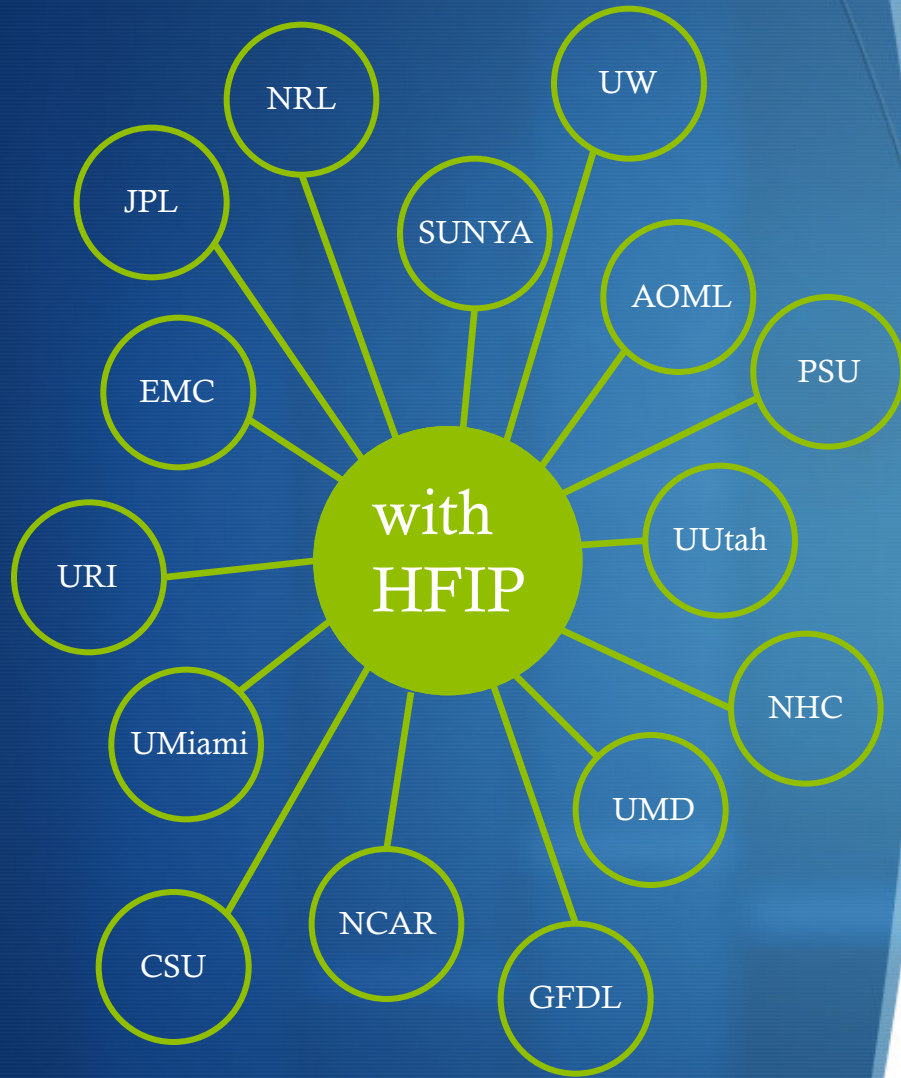


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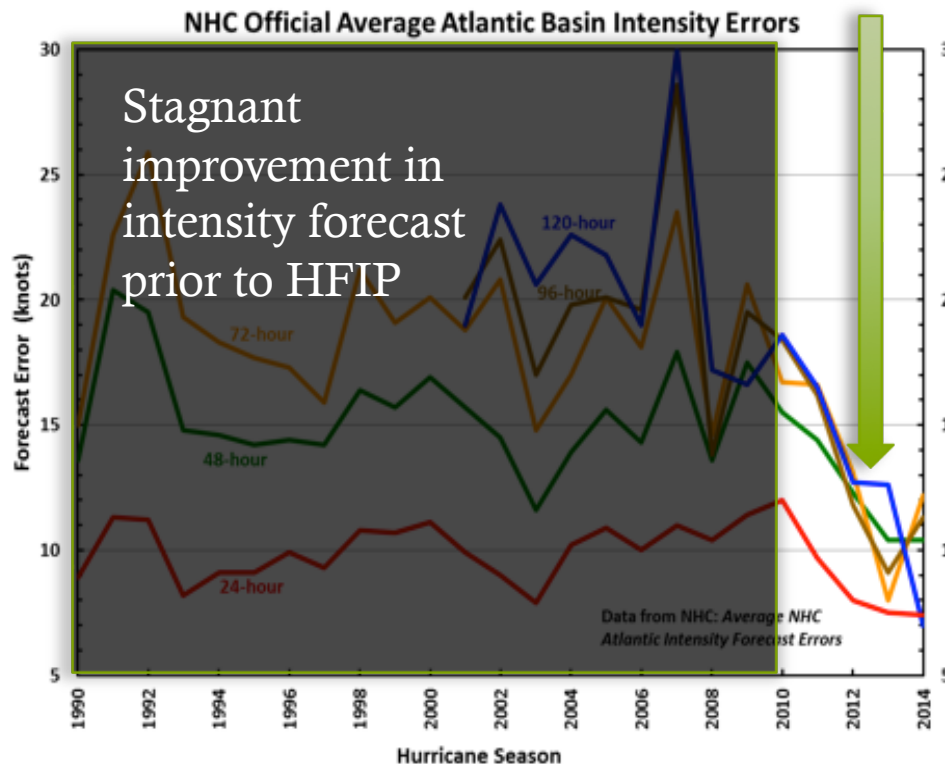
NOAA leveraged the **Developmental Testbed Center** to make the operational hurricane models, the data that goes into the models, and computational resources **accessible** to the broader research community.

- Research results are incorporated into actual forecasts
- Observational expertise in NOAA Research is leveraged to improve model physics
- Research community working closely with the Operational forecast community

The result has **accelerated** the development of NOAA models.

Current State of the Art

Operational Forecast Performance

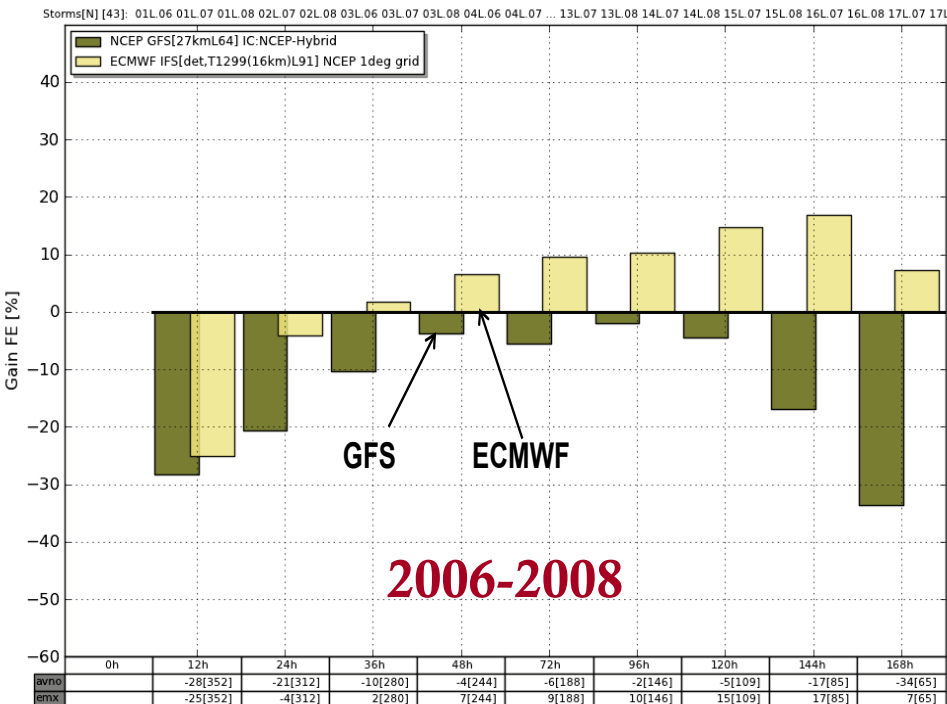


- Since HFIP began in 2008, forecast error has decreased by 20-25% for 24-120 hour (1-5 day) forecasts.
- NOAA upgraded the Hurricane Weather Research and Forecasting (HWRF) model resolution; now at 2 km
- Remarkable Improvement in HWRF since HFIP

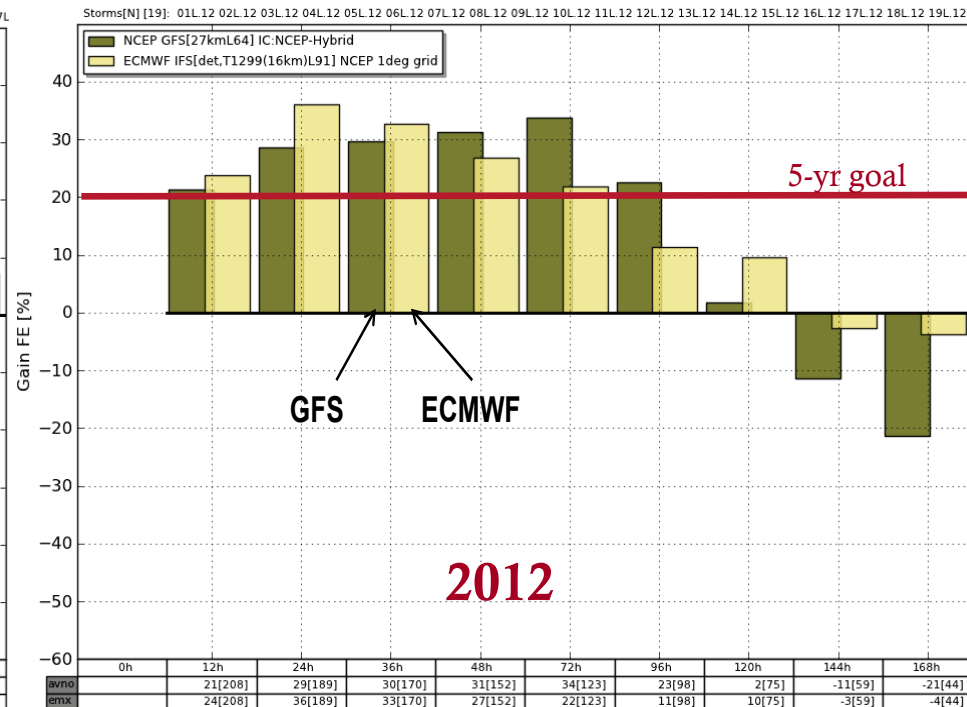
Global Forecast System (GFS)

Dramatic improvement in first 5 years of HFIP

LANT GFS v ECMWF %improve over HFIP baseline d+7 track error
pre-HFIP period 2006-2008



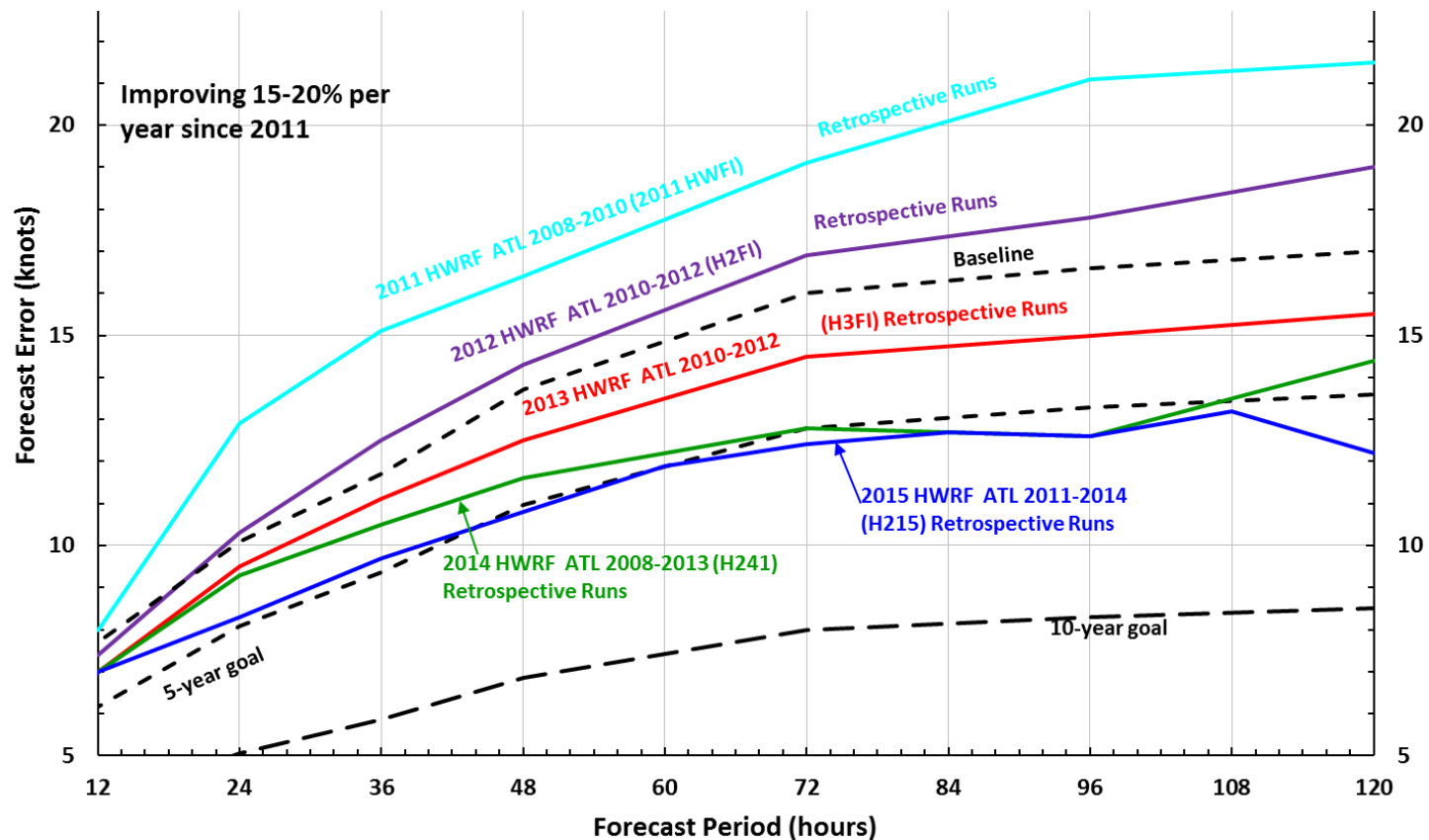
LANT GFS v ECMWF %improve over HFIP baseline d+7 track error
HFIP year 4 2012



Hurricane Weather Research Forecast Model (HWRF)

HWRF has demonstrated a remarkable 10-15 percent improvement in forecast accuracy each year since 2012.

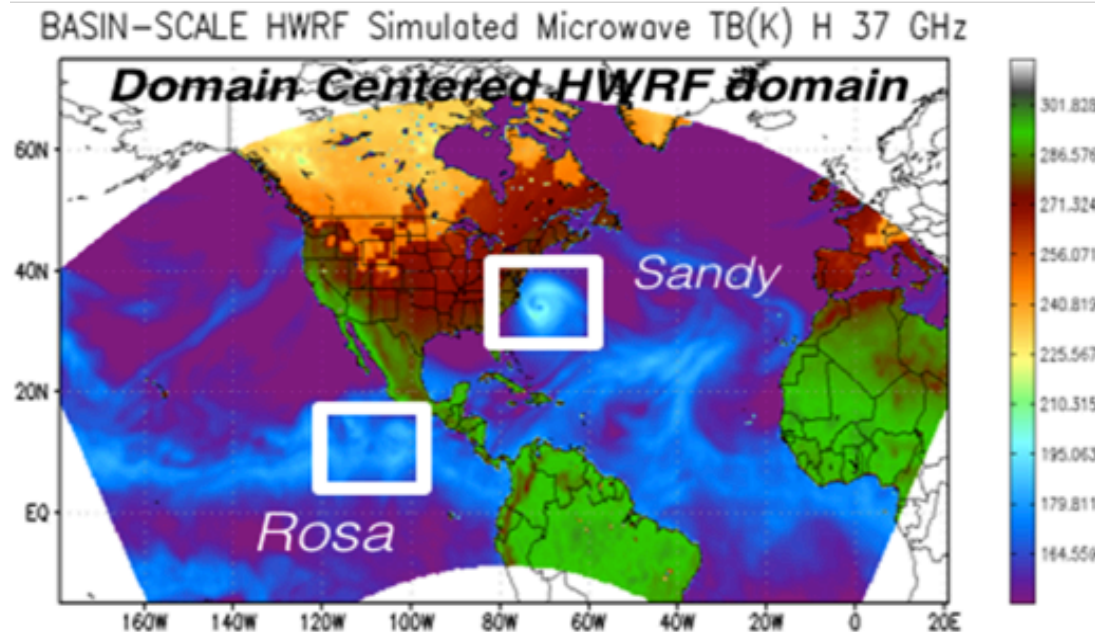
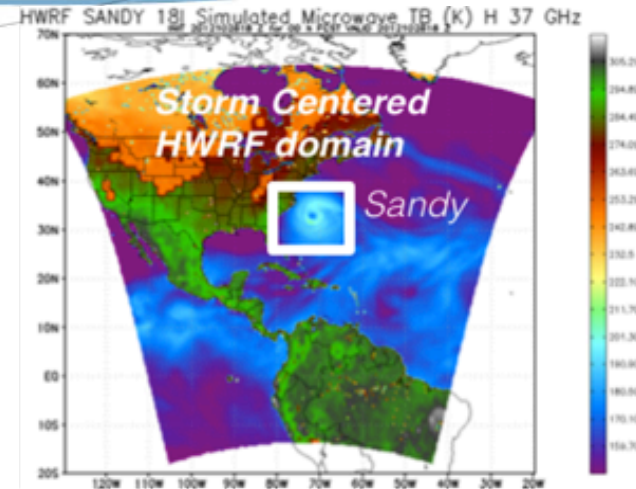
HWRF Intensity Forecast Improvements – Atlantic Basin



Basin-Scale HWRF

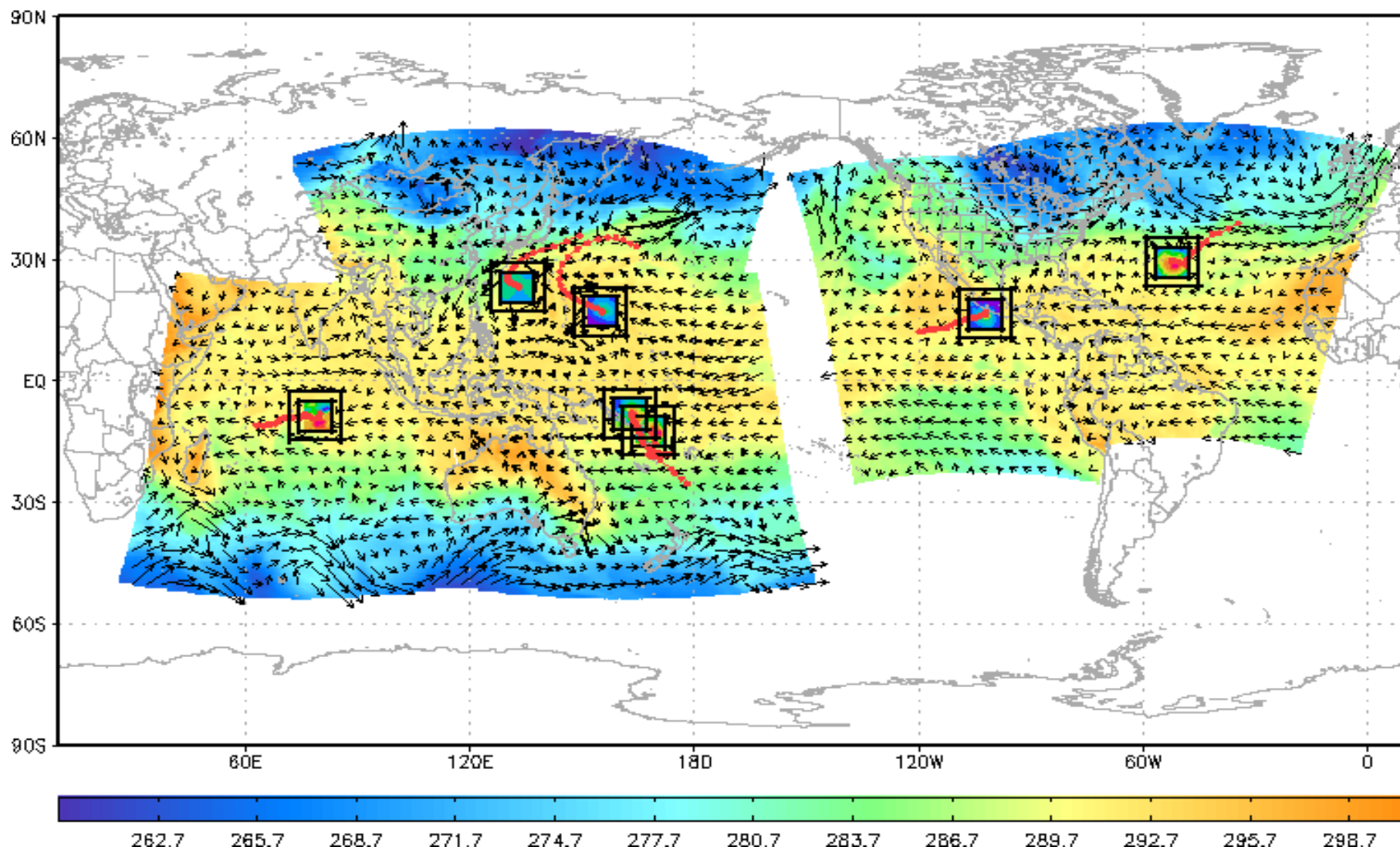
HWRF moved from a Storm Centered forecast to a Domain Centered forecast

- Multiple storms are now tracked in a single model
- Interaction between storms are now incorporated
- Landfall and post landfall effect as storm surge & rainfall)
- Storm Genesis is better predicted
- Regional ensembles
- Data assimilation is improved



Global HWRF

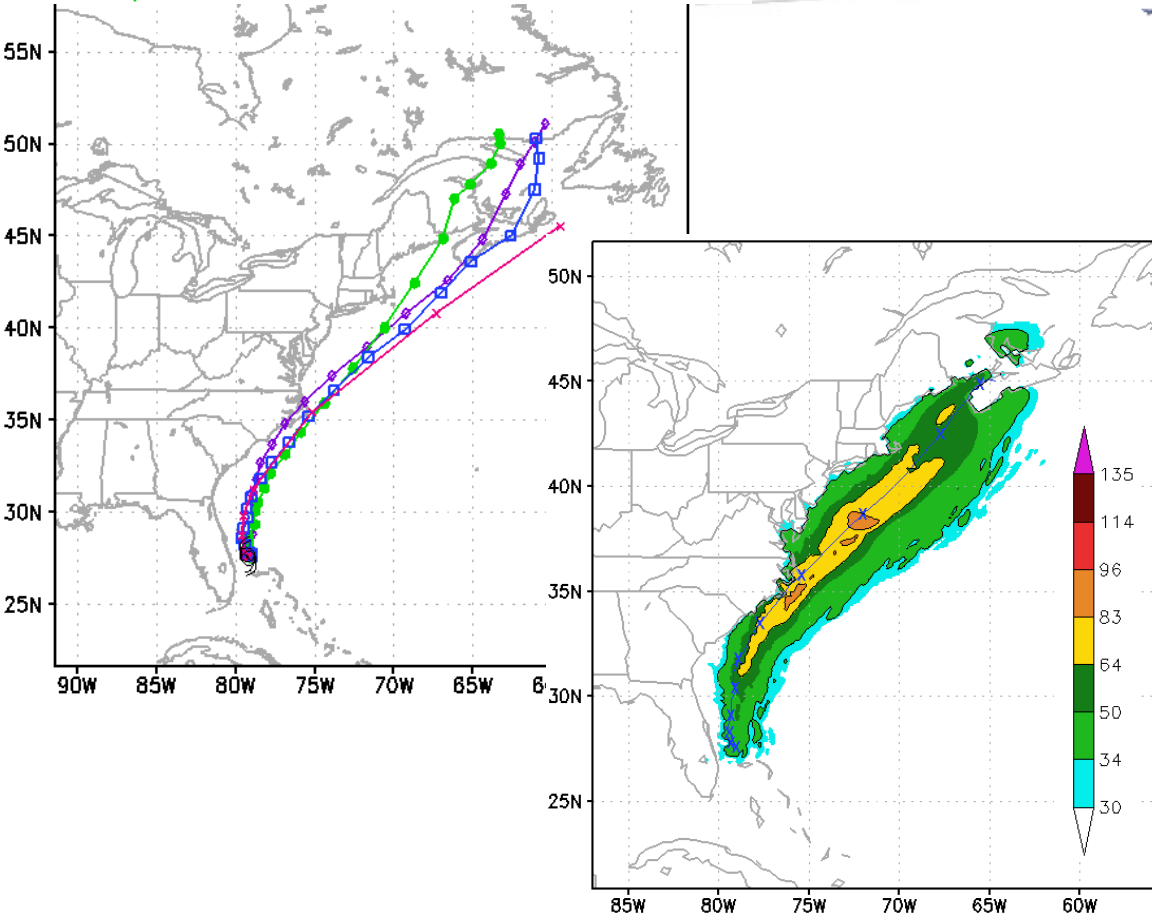
HWRF Forecast init:2013102212 F000



Hurricane Arthur

HWRF was the first model to accurately predict Hurricane Arthur would strike the Outer Banks in 2014

—●— HWRF: OPER —□— AVNO: Oper. GFS —×— OFCL: NHC Official
—●— GFDL: Oper. —■— NGPS: NOGAPS model — BEST: Best Track



- ◆ NOAA P-3 transmitted Tail Doppler radar data in real-time for assimilation into HWRF
- ◆ Resulting accurate forecast allowed NHC to effectively target warnings where they were needed, without over-warning the broader East Coast.

Thank you

<http://www.hfip.org/>

